SUBJECT INDEX

Active parameters 49
Agglomerated particulates
  classical scattering 20
  in combustion systems 13
Air pollution, alternative fuels 504
Alternative fuels 493
  air pollution 504
  background 494
  emissions data 506
  fundamental characteristics 499
Ammonia, high-temperature self-ignition 318
Annular solid body rotation flows and flames 356
Atomic resonance absorption spectroscopy (ARAS) 327, 330

Boundary layer corrections in reflected shock waves 331
Burke–Schumann limit 465

Carbon dioxide (CO_2) 373
  emissions and concentrations 377
  emissions from fossil fuel 369, 392
Carbon monoxide (CO), high-temperature self-ignition 310
Carbon slurries 410
Chemical combustion and material combustion characteristics 91
Chemical kinetic mechanisms 47
Chlorofluorocarbons (CFSs) 373
Climatic effects 389
Climatic models and their predictions 385
Coal combustion in fluidized beds 540
Coal particle temperature measurements 146
Coal pyrolysis 133
  accuracy of temperature measurement 205
  analysis of extractables in coals and chars 168
  analysis of gaseous products 170
  analysis of tar and soot products 162
  characterization of char products 153
  characterization of elemental composition of coal chars 161
  chemical description of 150
  Curie point heating 146
  definition of pyrolysis products 153
  determination of mass loss 162
  elemental composition 166
  emissivity 199
  entrained flow reactors 137, 195
  extractable fraction 156
  factors influencing variations in reported kinetic rates 178
  fixed beds 143
  fluidity 146, 157
  fluidized beds 143
  formation of pyrolysis products 150
  fragmentation of macromolecular network 156
  functional groups 159, 167
  gaseous volatile evolution 175
  heat effects 146
  heat transfer calculations 201, 203
  heat transfer effects 193
  heat transfer/mass transfer/reaction models 197
  heat transfer/reaction models 197
  heated grid experiments 136
  heated grid reactor studies 195
  heated tube reactor studies 138
  heats of reaction 198
  influence of model assumptions on reported rates 206
  kinetic rates
    of individual products 172
    variations with coal rank 178
  laser pyrolysis studies 196
  macromolecular network description 150
  macromolecular structure 154
  mass spectrometry 145
  mass transfer effects 182
  missing materials 171
  mobile phase 157
  modeling studies 196
  particle size effects 194
  physical properties 198
  radiative heating 142
  re-examination of kinetic data 208
  residence time determinations 208
  review of experiments 136
  sensitivity analysis for entrained flow reactors 203
  shock tubes 145
  softening 146
  specific heat 198
  tar evolution 175
  tar secondary reactions 168
  tar transport models 192
  TGA and other slow heating experiments 140
  thermal conductivity 199
  transparent wall reactor (TWR) 139
  transpiration cooling 200
  transport of gaseous volatile species 182
  transport of tar species 188
  weight loss 175
  weight loss measurements 208
  well-stirred reactors 140
Combustion characteristics and chemical combustion 91
Combustion instability related to vortex shedding in dump combustors and their passive control 117
Combustion modelling, decomposition product data in 106
Combustion of methane, *See* Methane combustion
Combustion products, pressure effect on 109
Combustion systems, agglomerated particulates in 13
Compressed natural gas (CNG) 502
Computer experiments 49
Conservation of mass 433
Conservation of total power 433

Decomposition product data in combustion modelling 106
Depolarization ratio, angular and wavelength dependence of 30
Deuterium, oxidation of 327
Diffusion flames, *See* Flames
Difluoroamino derivatives, high-temperature self-ignition 320
Disperse region, simulation of 92
Dissymmetry ratios 17
Drag coefficients 239

Drop arrays
and group combustion 284
combustion 264
dynamic properties 239
heat transfer between two spheres 228
ignition 258
mass transfer between two drops 229
mass transfer between three or more drops 231
point source method (PSM) 235
Drop clouds
combustion 275
confined volume 247
convective effects 283
critical group combustion 275
group combustion terminology 275
ignition 259
incipient group combustion 275
individual flame combustion 275
infinite volume 251
interactive evaporation 228, 246
isolated drop combustion 275
models for quiescent atmosphere 276
NS evaporation 256
partial group combustion 275
power law distribution 281
power law with fixed cloud mass 281
QS evaporation 252
QS monosized uniform 281
sheath combustion 276
spray combustion classification 284
statistical averaging procedure 251
total group combustion or group combustion 276
Drop combustion and interactive processes 224
Drop streams
combustion 270
ignition 258
interactive evaporation 244
monosized 244
two planar streams 245
Dump combustors
vortex shedding in 117
driving mechanism 127
large-scale structure breakdown: enhancement of fine-scale mixing 123
large-scale structures in isothermal shear layers 120
large-scale structures in reacting shear layers 122
passive control 127

Effect sparsity 49
Elastic scattering measurements, turbulent diffusion flames 472
Electric vehicles 503
Energy systems, entropic efficiency of 429
Entropic efficiency of energy systems 429
Entropy production
and heat transfer 435
and turbulent dissipation 434
foundations of 430
in boundary layer 439
in quenched flame 437
local 433
thermal microscale 435
thermodynamic foundations 431
Ethanol 501
high-temperature self-ignition 317
Extinction coefficient 18

Factorial design 49
Fast-heat-and-hold/FTIR 110
Fast reactions
allowance for multiple potential energy surfaces 82
on attractive potential surface 76
Fibre burners
downstream boundary 4
heat transport model for 1
analysis of numerical error 8
apparent emissivity 6
heat release function 6
heat transport equation 3
method of solution 7
sensitivity analysis 7
two-flux radiation model 3
upstream boundary 4
Flame quenching near surface 587
Flame spread
and smolder-spread transition 589
application to charring solids 571
background 554
breakdown of U vs D correlation for large D 577
decoupling of solid-phase problem 584
Delichatsios equation 575
deRis' model 556
experimental work 564
Fernandez–Pello–Williams model 560
finite reaction rate 586
first systematic studies 555
flow field 581
foundations: theory and experiment 555
Frey–T'ien model 563
infinite reaction rate 585
influences of finite-rate chemistry 574
influences of solid-phase conductivity 565
microgravity (μg) models 577
mixture-fraction considerations 584
numerical models of Bhattacharjee and Altenkirch 579
numerical simulations 568
Ohki–Tsugé model 560
opposed forced flow over thermally thick fuel slab 576
opposed-flow 553
over charring materials 589
over thick fuels 580
over thin fuels 585
qualitative order-of-magnitude models 576
second-generation studies 559
sectioning of physical plane 580
simplified analytical models 569
Sirignano model 559
specialized models 587
studies of Parker and Hirano 564
theoretical work 559
third-generation models 566
U vs D correlation 565
velocity-gradient models 572
Williams' fire-spread model 563
work of McAlevy *et al.* 557
work of Olson 578
Flames
diffusion 363
type II 362, 366
FTIR measurements of 113
$SiH_4/O_2/N_2$ 519
silane (SiH_2) 517
turbulent diffusion 463
Flash photolysis in shock tubes 327

Fluidized-bed combustion
coal 540
nitrous oxide (N_2O) emissions in 447
Fossil fuel combustion, CO_2 emission 369, 392
Fractal analysis of soot aggregates 34
FTIR measurements, of flames 113
Fuels, alternative. *See* Alternative fuels

Gasification and combustion, interactive processes in 221
Global climate change (GCC) 369
economic predictions 396
historical temperature trends 381
identity proposal 398
Global energy balance 569
Greenhouse effect 371
Greenhouse gases 369, 373, 530
identity proposal 398
U.S. vs world emissions 397
Group combustion and drop arrays 284

Heat transfer and entropy production 435
Heat transport model for fibre burners 1
analysis of numerical error 8
apparent emissivity 6
heat release function 6
heat transport equation 3
method of solution 7
sensitivity analysis 7
two-flux radiation model 3
High-temperature self-ignition 297
ammonia 318
branched chain reactions 304
carbon monoxide 310
difluoramino derivatives 320
ethanol 317
experimental investigations 308
hydrocarbons 306, 315
hydrogen 309
kinetic analysis of promotion models 298
kinetics of efficient promoting agents 319
methane 311
methanol 316
nitrites 319
nitrates 319
nitrous oxide 318
non-branched chain reactions 300
promotion by branching 303
promotion by radicals 298
promotion limits 321
searching efficient promoters 323
selection of kinetic scheme 300
Hydrocarbons, high-temperature self-ignition 306, 315
Hydrogen
fuels 502
high-temperature self-ignition 309
oxidation of 327
Hydrogen–oxygen reactions 50

Inlet vortices, characterization of 353
Interactive combustion 226
approximate criteria for 227
Interactive evaporation 228
drop arrays 228
drop clouds 246
drop streams 244
Interactive processes, correction factor 228
Interactive transport processes for liquid drop arrays and clouds 221
Internal recirculation zone (IRZ) 349, 350, 356, 366
and diffusion flames 363
and effective swirl number 365
effect of axial acceleration on 357
formation of 356
minimum swirl required for formation of 357
Ion–molecule reactions 85

Laser diagnostics
averaging modes 468
continuous wave (CW) laser 472
experimental configurations 468
general strategies for 468
global approach to spontaneous interactions 469
optics 469
pulsed lasers 472
Laser induced fluorescence (LIF) 484
absorption cross-sections 484
cross-sections 485
Laser photolysis in shock tubes 327
Light scattering 13
classical 16, 38
depolarized 28
from anisotropic molecules in flames 32
dynamic 38
fractal dimensions of flame soot from *in situ* measurements 36
isotropic dynamic 21
summary of techniques for characterization of combustion generated particulates 38
Liquid drop arrays and clouds, interactive processes 221
Liquified petroleum gas (LPG) 502
Lost heat 433
concept of 431
Lost work 431, 433

Metal slurries 410
Methane 373
high-temperature self-ignition 311
Methane combustion 47
computer experiments 57
experimental data for model optimization 56
initial reaction mechanism 50
rate coefficients 55, 56, 65
reaction model 50
reaction pathways 68
Methanol 499
high-temperature self-ignition 316
Methanol–15% unleaded gasoline fuels 500
Method of images (MOI) 221, 224
Mie scattering techniques
conditional seeding 474
turbulent diffusion flames 473
unconditional seeding 473
Momentum balance 433

Natural gas (CNG) fuels 502
Near surface gas product analysis 97
cell design and methods 97
characteristics of evolved products 99
quantitation processes 97
structure/decomposition relationships 101
studies of energetic compounds 106
tendency to form $CH_2O(g)$ 105

tendency to form HONO(g) 103
tendency to form N_2O(g) 104
tendency to form NO_2(g) 102
Nitrates, high-temperature self-ignition 319
Nitrites, high-temperature self-ignition 319
Nitrous oxide (N_2O) 373
abatement in combustion systems 459
atmospheric sources 448
chemistry of 534
detection techniques 532
effect of coal rank on emissions 541
effect of fuel type on emissions 455
effect of load and air split on emissions 458
effect of NO_x reduction techniques on emissions 548
effect of pressure on emissions 458
effect of scalability on emissions 459
effect of solids on emissions 545
effect of stoichiometry 542
effect of temperature on emissions 455
effect of temprature on emissions from fluidized beds 540
emissions from combustion sources 529
emissions in fluidized-bed combustion 447
flame reactions 449
formation and destruction
chemistry of 449
in gaseous flames 537
from coal combustion in fluidized beds 540
from volatile matter or from char? 542
fundamental heterogeneous reactions 451
fundamental homogeneous reactions 449
general considerations 530
global inventory of emissions 448
heterogeneous reactions producing and removing 537
high-temperature self-ignition 318
homogeneous reactions producing 534
homogeneous vs heterogeneous reactions 452
measurement from combustion systems 453
postflame reactions 450
production in combustion systems 454
reactions destroying 534
sources of 531
Nusselt number 239, 442

Objective function 49
Ozone 373
Ozone layer 530

Particle size determination 17
Pipe rotation flows and flames 356
Point source method (PSM) 221, 224
drop arrays 235
Prandtl number 442
Pressure effect on combustion products 109
Pulse combustion systems 441

Quenched flame 436
entropy production in 437
Quenching reactions 87

Radical–radical reactions 86
Raman cross-sections, vibrational 481
Raman interactions, turbulent diffusion flames 479
Raman scattering
mapping experiments 484
spontaneous 479
vibrational 481
Raman spectra, turbulent diffusion flames 481
Rapid-scan FTIR spectroscopy 96
Rate constants
fast reactions with no activation energy 75
measurement of 327
Rayleigh scattering
density measurements 476
derivation of mixing data 477
instantaneous global reaction rate estimate 476
spectral filtering 479
temperature measurements 476
turbulent diffusion flames 475
Resonant radiation, trapping 486
Response surfaces 49
Reynolds number 442, 588
Rocket propulsion 91
RRKM theory 77
application of 83

Scalars in turbulent diffusion flames 463
finite chemistry and strain effects 466
properties of 464
unsteady processes 467
Scattering and extinction ratio 18
Scattering coefficients 18
Shock tubes
flash photolysis in 327
laser photolysis in 327
Silane (SiH_4) 513
burning velocity in $SiH_4/O_2/N_2$ flames 519
chain branching ignition 515
chemical properties 514
combustion modeling 519
flame characteristics 517
ignition and combustion at the above atmospheric pressure 516
ignition under reduced pressures 515
oxidation and combustion
by other oxidative gases 519
characteristics of 514
elementary reactions related to 522
pyrolysis 522
rate contents of atom and radical reactions with 523
reaction mechanism 519
reaction stoichiometry and products in oxidation and combustion 514
SiH_2 reactions 526
SiH_3 reactions 524
Silylidyne (SiH) radicals 526
Simultaneous mass and temperature change/FTIR spectroscopy (SMATCH/FTIR) 93
Slurry fuels 409
burning characteristics 411
droplet fragmentation techniques 424
particle agglomeration 415
Solution mapping 47, 49
Spot aggregates, fractal analysis of 34
Spherical particles, accuracy of measurement method for 26
Spray evaporation and combustion 286
Swirl numbers 353, 362
Swirling flows 349
impact of combustion on 366
Systemic optimization 47

Temperature profiling/FTIR spectroscopy 106
Time-resolved infrared spectral photography (TRISP) 112
T-jump/FTIR spectroscopy 110
Triple-flame problem 587
Turbulent diffusion flames
  burner configurations 468
  concentration measurements 487
  elastic scattering measurements 472
  Mie scattering techniques 473
  multi-species point measurements 483
  Raman interactions 479
  Raman spectra 481
  Rayleigh scattering 475
  scalars in 463
  temperature measurements 483
Turbulent dissipation and entropy production 434

Vortex shedding in dump combustors 117
  driving mechanism 127
  large-scale structure breakdown: enhancement of fine-scale mixing 123
  large-scale structures in isothermal shear layers 120
  large-scale structures in reacting shear layers 122
  passive control 127

Water vapor (H_2O) 373